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Re:	Contribution on comments to IEEE 802.16g-05/008r2	
Abstract	Section clean up for 14.5.9.4-14.5.9.7.	
Purpose	Adoption	
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# Clean Up Section 14.5.9.4 -14.5.9.7

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## 1. Introduction

In response to the clause editing action item assigned in IEEE 802.16 session #40, this contribution includes text changes for section 14.5.9. This clean up includes the naming convention modification based on contribution C80216g-05\_052r4 which was accepted in session #40.

As part of the modification for the primitives' names, the following are defined:

### SAP

- C – Control plane SAP
- M – Management plane SAP

### Function

- SMC – Secondary Management Connection
- SFM – Service Flow Management

### Operation

- REQ – Request
- RSP – Response to the REQ message
- ACK – Acknowledgement to the reception of RSP or NOTIFY message
- NOTIFY – Event Notification

## 2. Proposed Solution

The following changes are made in section 14.5.9.4-14.9.5.7:

1. Rename Primitives. The following table provides a mapping between the old and new names of the primitives:

Existing Primitives	New Primitives
HO request (Source BS to NCMS)	C-HO-REQ(Op==Action, Action_Type==HO-Serving)
HO indication (NCMS to Target BS)	C-HO-REQ (Op==Action, Action_Type==HO-Target)
HO response (NCMS to Source BS)	C-HO-RSP(Op==Action, Action_Type==HO-Serving)
HO confirmation (Target BS to NCMS)	C-HO-RSP (Op==Action, Action_Type==HO-Target)
HO start	C-HO-NOTFY(Event_Type==HO_Start)
HO cancel	C-HO-NOTFY(Event_Type==HO_Cancel)

HO Directive (NCMS to Source BS)	C-HO-REQ(Op==Action, Action_Type==HO-Serving)
Scanning.request	C-HO-REQ(Op==Action, Action_Type==Scan)
Scanning.response	C-HO-RSP(Op==Action, Action_Type==Scan)

2. Due to the renaming and merging of some primitives, the section is re-arranged. However, the content of the primitives are kept same except for some additional fields due of adopted changes in contribution C80216g-05\_052r4.
3. Use of 802.16 Entity instead of BS. An 802.16Entity can be either a BS or MS. When a primitive is defined for both BS and MS unless specified otherwise.
4. Primitive diagrams are modified according to contribution C80216g-05\_052r4 and also the introducing of 802.16 Entity
5. Most of the text modification shown is due to re-arranging of the section. Only minor text modification is introduced.

### 3. Detail Text Changes

*[Modify section 14.5.9.4-14.9.7 as the following]*

#### 14.5.9.4 MS Handover Management

<Section Note: How an MS handles its handover functions>

#### 14.5.9.5 Inter BS Handover Management

<Section Note: How a BS handles its handover functions with neighboring BSes>

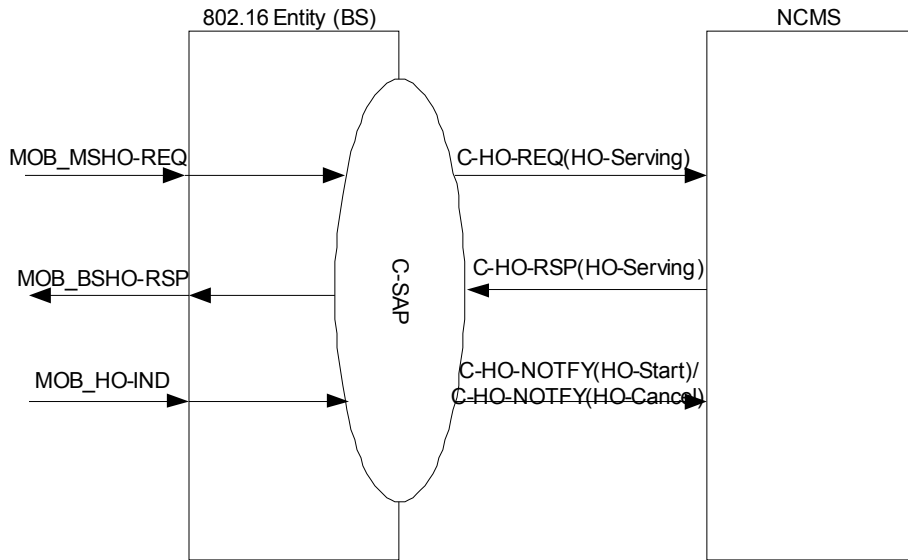
#### 14.5.9.6 Macro Diversity Management

<Section Note: How a BS along with the NCMS entities handles macro diversity>

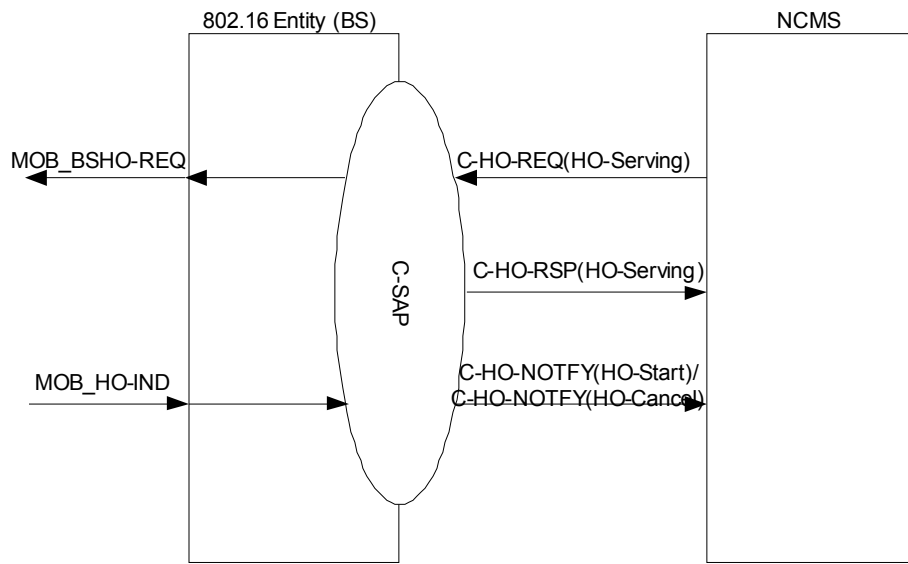
#### 14.5.9.7 Handover Control Protocol Procedures

##### 14.5.9.7.1 HO Control Primitives

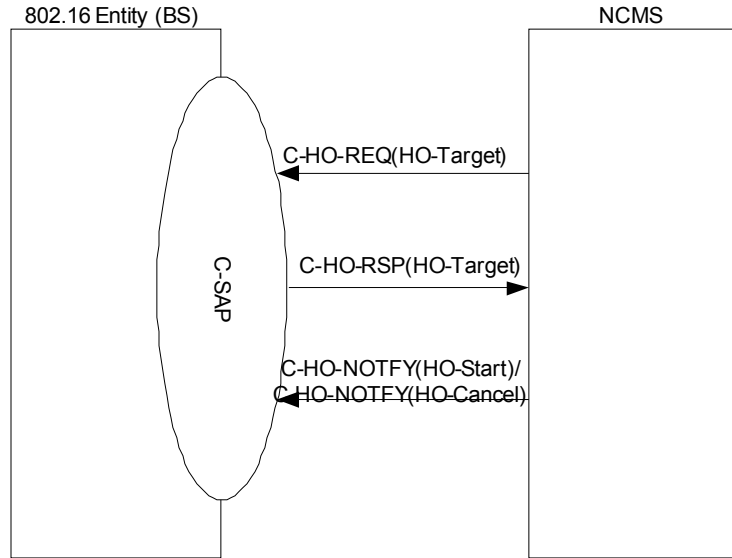
The HO Control Primitives are a set of primitives for supporting HO procedure between 802.16 EntityBS and NCMS. They are defined for access to the Mobility Control entity to support handovers.



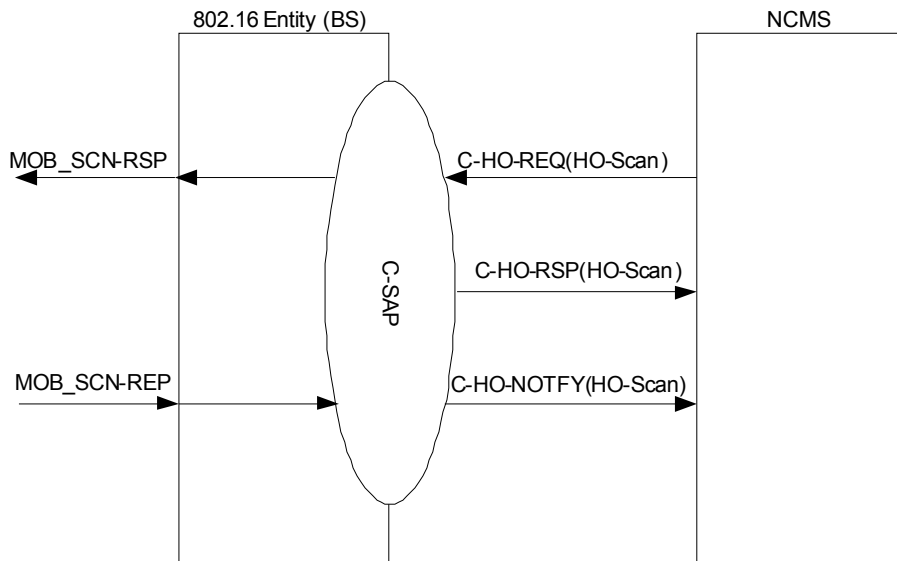
**Figure xxx HO primitives flow between Serving BS and NCMS, BS initiated**



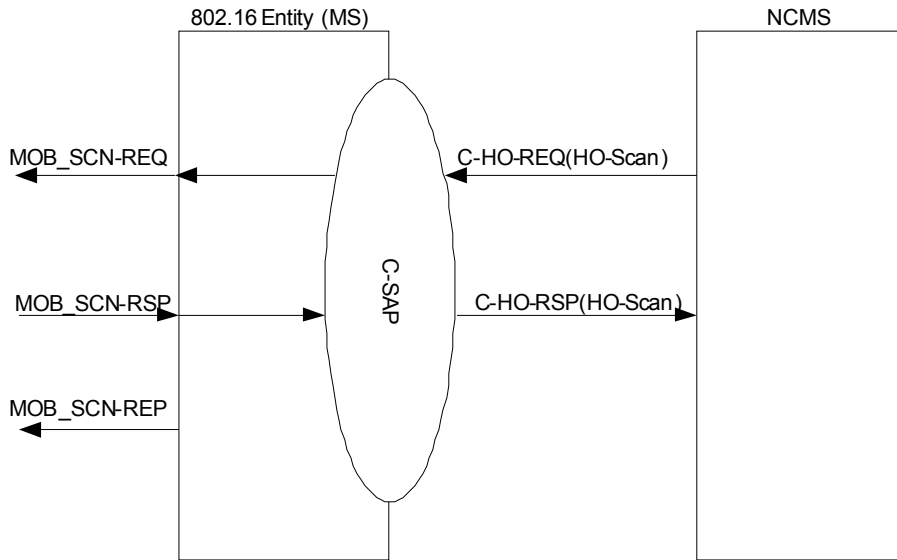
**Figure xxx HO primitives flow between Serving BS and NCMS, NCMS initiated**



**Figure xxx HO primitives flow between Target BS and NCMS**



**Figure xxx HO primitives flow between 802.16 BS Entity and NCMS for Scanning**



**Figure xxx HO primitives flow between 802.16 MS Entity and NCMS for Scanning**

**14.5.9.7.1 C-HO-REQ**

This primitive is used by a BS or NCMS to trigger a handover procedure. The Action Type included in this primitive defines the type of handover procedure to be performed. The possible Action Types for this primitive are listed in Table xxx

<u>Action Type</u>	<u>Description</u>
<u>HO-Serving</u>	<u>Handover procedure between current serving BS and NCMS.</u>
<u>HO-Target</u>	<u>Handover procedure between target BS and NCMS</u>
<u>HO-Scan</u>	<u>Neighbor BS scanning procedure.</u>

The following sub-sections define the primitive when its action type is set to a specific action..

**14.5.9.7.1.1 HO request C-HO-REQ(Action\_Type==HO-Serving)**

**14.5.9.7.1.1.1 Function**

This primitive is used by a serving BS to inform the mobility control entity in NCMS of to start an incoming-HO request from an MS procedure. The primitive is only used by 802.16 BS entity and NCMS at BS side.

**14.5.9.7.1.1.2 Semantics of the service primitive**

The following parameters are included in this primitive.

**C-HO-REQ**

- (
- Message\_id,
- Operation\_Type(Action),
- Action\_Type(HO-Serving),

Object\_id(BS\_ID or NCMS).

Attribute\_list:

Serving BS ID

MS ID

HO Type

Mode

Candidate target BS list

Service flow information

CS parameter information

)

**Serving BS ID**

Base station unique identifier (Same number as that broadcasted on the DL-MAP message).

**MS ID**

48-bit unique identifier used by MS.

**HO Type**

Indication of HO types; HO or SHO/FBSS.

**Mode**

Various modes in Anchor BS update or Active Set Update.

**Candidate target BS list**

For BS generated primitive, tThis is the list of BSes which are recommended for a target BS or an active BS by the MS. Additional HO quality information such as Service Level Prediction also can be included in this list. For NCMS generated primitive, this is the list of recommended target BSes by the mobility control entity. The BSs in the list may be the candidate target BSs for HO or an Anchor BS or Active BSs for SHO/FBSS according to the value of HO type and Mode MS Access Information, Newly Allocation Information, and HO Quality Information can be included in this list

**Service flow Information**

Information of all the service flows that have been established between the MS and the serving BS.

**CS parameter information**

Approved IP filter rules of a service flow such as packet classification rule and IPv6 flow label.

**14.5.9.7.1.1.3 When generated**

**14.5.9.7.1.1.3.1 802.16 BS Entity to NCMS**

This primitive is generated when the BS receives a MOB\_MSHO-REQ message from the MS

**14.5.9.7.1.1.3.2 NCMS to 802.16 BS Entity**

This primitive is used when the mobility control entity in NCMS instructs the BS to start handover procedure for a particular MS.

**14.5.9.7.1.1.4 Effect of receipt**

**14.5.9.7.1.1.4.1 802.16 BS Entity to NCMS**

The mobility control entity in NCMS processes the information from this primitive. And it may trigger a handover procedure to one or more target BS.

**14.5.9.7.1.1.4.2 NCMS to 802.16 BS Entity**

The BS processes the information from this primitive and shall send MOB\_BSHO-REQ to the MS to start the handover procedure.

#### **14.5.9.7.1.2 C-HO-REQ(Action\_Type==HO-Target)HO indication**

##### **14.5.9.7.1.2.1 Function**

This primitive is used by the mobility control entity in NCMS to inform target BSes of the pending HO. The primitive is only used by 802.16 BS entity and NCMS at BS side.

##### **14.5.9.7.1.2.2 Semantics of the service primitive**

It delivers the following parameters.

#### **C-HO-REQ**

```
(
    Message_id,
    Operation_Type(Action),
    Action_Type(HO-Target),
    Object_id(BS_ID),

    Attribute_list:
    Serving BS ID
    MS ID
    HO Type
    Mode
    Service flow information
    HO Quality Information
    CS parameter information
)
```

#### **Serving BS ID**

Base station unique identifier (Same number as that broadcasted on the DL-MAP message)

#### **MS ID**

48-bit unique identifier used by MS

#### **HO Type**

Indication of HO types; HO or SHO/FBSS

#### **Mode**

Various modes in Anchor BS update or Active Set Update

#### **Service flow Information**

Information of all the service flows that have been established between the MS and the serving BS

#### **HO Quality Information**

Information related with quality of HO procedure; Service Level Prediction, HO Optimization Flag, Arrival Time Difference, etc.

#### **CS parameter information**

Approved IP filter rules of a service flow such as packet classification rule and IPv6 flow label

##### **14.5.9.7.1.2.3 When generated**

When the mobility control entity in NCMS determines a target BS for a MS to handover to, the NCMS generates this primitive to start the handover process at the target BS.



**14.5.9.7.1.2.4 Effect of receipt**

The target BS prepares for the MS handover for pre-allocating resources to the MS and sends response to the NCMS.

**14.5.9.7.1.3 C-HO-REQ(Action\_Type==HO-Scan)**

**14.5.9.7.1.3.1 Function**

This primitive is issued by the mobility management entity in NCMS to request radio signal information of MSs.

**14.5.9.7.1.3.2 Semantics of the service primitive**

The parameters of the primitive are as follow:

```

Scanning.requestC-HO-REQ
(
    Message_id,
    Operation_Type(Action),
    Action_Type(HO-Scan),
    Object_id(BS_ID or MS_ID),
    Attribute_list:
        Number of MS,
        List of MS ID
)
Number of MS
Number of MSs
List of MS ID
The list of MS ID
    
```

**14.5.9.7.1.3.3 When generated**

This primitive is generated when the mobility management entity in NCMS decides **MS should perform scanning of neighbor BSs and report the scanning result to NCMS** that BS-initiated HO should be occurred because the BS is about to be overloaded.

**14.5.9.7.1.3.4 Effect of receipt**

The BS shall response to the scanning.request primitive using scanning.response primitiveWhen the primitive is received by a 802.16 BS entity, the 802.16 BS entity shall transmit MOB\_SCAN-RSP to the MS to trigger the scanning procedure at the MS and generates C-HO-RSP(HO-Scan) to respond to NCMS. . When the primitive is received by the 802.16 MS entity, the 802.16 MS entity shall transmit MOB\_SCAN-REQ to the BS.

**14.5.9.7.2 C-HO-RSP**

This primitive is used by a 802.16 entity or NCMS to respond a handover request. The Action Type included in this primitive defines the type of handover procedure to be performed. The possible Action Types for this primitive are listed in Table xxx

<b>Action Type</b>	<b>Description</b>
--------------------	--------------------

<u>HO-Serving</u>	<u>Handover procedure between current serving BS and NCMS.</u>
<u>HO-Target</u>	<u>Handover procedure between target BS and NCMS</u>
<u>HO-Scan</u>	<u>Neighbor BS scanning procedure.</u>

The following sub-sections define the primitive when its action type is set to a specific action..

#### **14.5.9.7.2.1.3 HO response C-HO-RSP(Action\_Type==HO-Serving)**

##### **14.5.9.7.2.1.1 Function**

This primitive is generated by mMobility cControl entity in NCMS ~~responds to the~~ the serving 802.16 BS Entity with the list of recommended target BSes. This primitive is ~~always~~ sent in reply to the ~~HO request~~ C-HO-RSP(HO-Serving) primitive.

##### **14.5.9.7.2.1.2 Semantics of the service primitive**

The following parameters are included in this primitive.

```

C-HO-RSP{
(
    Message_id,
    Operation_Type(Action),
    Action_Type(HO-Serving),
    Object_id(BS_ID or NCMS),

    Attribute_list:
    MS ID
    HO Type
    Mode
    Recommended target BS list
)

```

##### **MS ID**

48-bit unique identifier used by MS

##### **HO Type**

Indication of HO types; HO or SHO/FBSS

##### **Mode**

Various modes in Anchor BS update or Active Set Update

##### **Recommended target BS list**

The list must be a subset of the candidate target BS list from the corresponding HO request. The recommended target BS list is to be delivered to the MS in the MOB\_BSHO-RSP. The BSes in the list may be the candidate target BSes for HO or an Anchor BS or Active BSes for SHO/FBSS according to the value of HO type and Mode. MS Access Information, Newly Allocation Information, and HO Quality Information can be included in this list

##### **14.5.9.7.2.1.3 When generated**

###### **14.5.9.7.2.1.3.1 802.16 BS Entity to NCMS**

This primitive is generated to respond to C-HO-REQ(HO-Serving) primitive from NCMS.

###### **14.5.9.7.2.1.3.2 NCMS to 802.16 BS Entity**

This primitive is used when the mobility control entity in NCMS accepts or rejects the HO request from the MS. This primitive includes a list of recommended target BSs from NCMS.

**14.5.9.7.2.1.4 Effect of receipt****14.5.9.7.2.1.4.1 802.16 BS Entity to NCMS**

The mobility control entity in NCMS processes the information contained in the primitive.

**14.5.9.7.2.1.4.2 NCMS to 802.16 BS Entity**

The BS processes the information from this primitive and shall send MOB\_BSHO-RSP to the MS.

**14.5.9.7.2.1.4 HO confirmation C-HO-RSP(Action\_Type==HO-Target)****14.5.9.7.2.2.1 Function**

This primitive is used by the target ~~802.16 BS entity to responds~~ responding to the ~~HO indication~~ C-HO-REQ(HO-Target) primitive from ~~the serving BS or the~~ mobility control entity in NCMS. ~~It delivers the following parameters:~~

**14.5.9.7.2.2.2 Semantics of the service primitive**

The following parameters are included in this primitive.

**C-HO-RSP{**

{

Message\_id,

Operation\_Type(Action),

Action\_Type(HO-Target),

Object\_id(NCMS),

Attribute\_list:

MS ID

Target BS ID

Result Flag

HO Type

Mode

MS Access Information

Newly Allocated Information

HO Quality Information

}

**Target BS ID**

Base station unique identifier of the target BS

**MS ID**

48-bit unique identifier used by MS

**Result Flag****HO Type**

Indication of HO types; HO or SHO/FBSS

**Mode**

Various modes in Anchor BS update or Active Set Update

**MS Access Information**

Information needed by MS to access the target BS; HO ID, CQI CH Information, HO Authorization Policy Information

**Newly Allocated Information**

Newly allocated information for the MS or each service flow; SAID, CID

**HO Quality Information**

Information related with quality of HO procedure; HO Optimization Flag,  
Service Level Prediction

#### **14.5.9.7.2.2.3 When generated**

When the target 802.16 BS entity generates this primitive to respond to the C-HO-REQ(HO-Target) primitive from the NCMS.

#### **14.5.9.7.2.2.4 Effect of receipt**

The mobility control entity in NCMS processes the information contained in this primitive and may generate a primitive to the serving 802.16 BS entity to proceed in the HO procedure.

#### **14.5.9.7.2.3 Scanning.responseC-HO-RSP(Action\_Type==HO-Scan)**

##### **14.5.9.7.2.3.1 Function**

This primitive is issued by ~~the BS~~ an 802.16 BS entity to respond to ~~scanning.request~~ C-HO-REQ(HO-Scan)

##### **14.5.9.7.2.3.2 Semantics of the service primitive**

The parameters of the primitive are as follows:

#### **Scanning.confirmationC-HO-RSP**

```
(
    Message_id,
    Operation_Type(Action),
    Action_Type(HO-Scan),
    Object_id(NCMS),

    Attribute_list:
        Number of MS,
        List of MS ID,
        List of Signal information
)
```

#### **Number of MS**

Number of MSs

#### **List of MS ID**

The list of MS ID

#### **List of Signal Information**

TBD.

#### **14.5.9.7.2.3.3 When generated**

For a 802.16 BS entity, this primitive is generated when ~~the BS~~ receives ~~scanning.request~~ C-HO-REQ (HO-Scan). For a 802.16 MS entity, this primitive is generated when the MS receives MOB\_SCN-RSP message.

#### **14.5.9.7.2.3.4 Effect of receipt**

The mobility management entity in NCMS may decide the specific MS and its potential target BS for BS-initiated HO based on the reported signal quality in the ~~scanning.response~~ C-HO-RSP(HO-Scan) primitive.

#### **14.5.9.7.3 C-HO-NOTFY**

This primitive is used by a BS or NCMS to notify the other entity of a handover event. The possible Event\_Types for this primitive are listed in Table xxx

<u>Event Type</u>	<u>Description</u>
<u>HO-Start</u>	<u>Indicating the MS is ready to handover from the current serving BS to the target BS</u>
<u>HO-Cancel</u>	<u>Indicating the current HO procedure is cancelled.</u>
<u>HO-Scan</u>	<u>Providing scanning result to NCMS</u>

The following sub-sections define the primitive when its event\_type is set to a specific action..

#### **14.5.9.7.3.14.5 HO\_startC-HO-NOTFY(Event\_Type==HO-Start)**

##### **14.5.9.7.3.1.1 Function**

In case of HO, this primitive is used to indicate the starting of the actual HO. In case of SHO/FBSS, it can be used to update Anchor BS or to add a new Active BS to the current Active set. Both of the serving 802.16 BS\_entity and the mobility control entity in NCMS can use this primitive to inform the 802.16 target BS\_entity or the mobility control entity in NCMS of the starting of the actual HO.

##### **14.5.9.7.3.1.2 Semantics of the service primitive**

The following parameters are included in this primitive.

```

C-HO-NOTFY
(
    Message_id,
    Event_Type(HO-Start),
    Object_id(BS_ID or NCMS),

    Attribute_list:
        MS ID
        HO Type
        Mode
        Target BS ID
)

```

**MS ID** 48-bit unique identifier used by MS

**HO Type** Indication of HO types; HO or SHO/FBSS

**Mode** Various modes in Anchor BS update or Active Set Update

**Target BS ID** Base station unique identifier to which the MS attempts the actual HO

##### **14.5.9.7.3.1.3 When generated**

###### **14.5.9.7.3.1.3.1 802.16 BS Entity to NCMS**

This primitive is generated when MOB\_HO-IND is received from the MS.

###### **14.5.9.7.3.1.3.2 NCMS to 802.16 BS Entity**

This primitive is used by the mobility control entity in NCMS to inform the target 802.16 BS entity the

start of the MS handover.

#### **14.5.9.7.3.1.4 Effect of receipt**

##### **14.5.9.7.3.1.4.1 802.16 BS Entity to NCMS**

The mobility control entity in NCMS processes the information contained in the primitive and may generate C-HO-NOTFY(HO-Start) to the target 802.16 BS entity.

##### **14.5.9.7.3.1.4.2 NCMS to 802.16 BS Entity**

The target 802.16 BS entity prepares for the MS handover as indicated in this primitive.

#### **14.5.9.7.3.2.6 HO-cancelC-HO-NOTFY(Event\_Type==HO-Cancel)**

##### **14.5.9.7.3.2.1 Function**

In case of HO, this primitive indicates the cancellation of the pending HO. In case of SHO/FBSS, it can be used to cancel anchor BS update or Active set update, or to remove a target BS from the current active set. Both of the serving 802.16 BS entity and the mobility control entity in NCMS can use this primitive.

##### **14.5.9.7.3.2.2 Semantics of the service primitive**

This primitive conveys the following parameters.

```

C-HO-NOTFY
(
    Message_id,
    Event_Type(HO-Start),
    Object_id(BS_ID or NCMS),
    Attribute_list:
        MS ID
        HO Type
        Mode
)
  
```

**MS ID** 48-bit unique identifier used by MS

**HO Type** Indication of HO type; HO and SHO/FBSS

**Mode** It is valid for SHO/FBSS and cancels Anchor BS update or Active set update. In addition, it may indicate removal of the target BS from the current active set.

##### **14.5.9.7.3.2.3 When generated**

##### **14.5.9.7.3.2.3.1 802.16 BS Entity to NCMS**

This primitive is generated when MOB\_HO-IND is received from the MS.

##### **14.5.9.7.3.2.3.2 NCMS to 802.16 BS Entity**

This primitive is used by the mobility control entity in NCMS to inform the target 802.16 BS entity the HO procedure is cancelled.

#### **14.5.9.7.3.2.4 Effect of receipt**

##### **14.5.9.7.3.2.4.1 802.16 BS Entity to NCMS**

The mobility control entity in NCMS processes the information contained in the primitive and may generate C-HO-NOTFY(HO-Cancel) to the target 802.16 BS entity.

##### **14.5.9.7.3.2.4.2 NCMS to 802.16 BS Entity**

The target 802.16 BS entity shall release all resources related to the MS handover.

#### **14.5.9.7.3.3 C-HO-NOTFY(Event\_Type==HO-Scan)**

##### **14.5.9.7.3.3.1 Function**

This primitive is used to indicate the reception of MOB\_SCAN-REP message from the MS. The 802.16 BS Entity uses this primitive to report MS radio information to the NCMS.

##### **14.5.9.7.3.3.2 Semantics of the service primitive**

The following parameters are included in this primitive.

```

C-HO-NOTFY
(
    Message_id,
    Event_Type(HO-Scan),
    Object_id(NCMS),
    Attribute_list:
        MS ID
        RF Signal information
)

```

```

MS ID      48-bit unique identifier used by MS
RF Signal Information
    TBD.

```

##### **14.5.9.7.3.3.3 When generated**

This primitive is generated by 802.16 BS Entity when it receives a MOB\_SCAN-REP.

##### **14.5.9.7.3.3.4 Effect of receipt**

NCMS processes the information and may decide to trigger a BS-initiated handover.

#### **14.5.9.7.1.7 HO Directive**

This primitive is generated by the Mobility Control entity in NCMS to induce the handover of a particular MS. Transmission of MOB\_BSHO-REQ message is triggered by this primitive.

**MS-ID**

48-bit unique identifier used by MS

**HO-Type**

Indication of HO types; HO or SHO/FBSS

**Mode**

Various modes in Anchor BS update or Active Set Update

**Recommended target BS list**

This is the list of recommended target BSes by the mobility control entity. The BSes in the list may be the candidate target BSes for HO or an Anchor BS or Active BSes for SHO/FBSS according to the value of HO type and Mode. MS Access Information, Newly Allocation Information, and HO Quality Information can be included in this list

**14.5.9.7.1.8 Scanning.request****14.5.9.7.1.8.1 Function**

This primitive is issued by the mobility management entity in NCMS to request radio signal information of MSs.

**14.5.9.7.1.8.2 Semantics of the service primitive**

The parameters of the primitive are as follow:

**Scanning.request**

```
(
  Number of MS,
  List of MS-ID
)
```

**Number of MS**  
Number of MSs

**List of MS-ID**  
The list of MS-ID

**14.5.9.7.1.8.3 When generated**

This primitive is generated when the mobility management entity in NCMS decides that BS-initiated HO should be occurred because the BS is about to be overloaded.

**14.5.9.7.1.8.4 Effect of receipt**

The BS shall response to the scanning.request primitive using scanning.response primitive.

**14.5.9.7.1.9 Scanning.response****14.5.9.7.1.9.1 Function**

This primitive is issued by the BS to respond to scanning.request



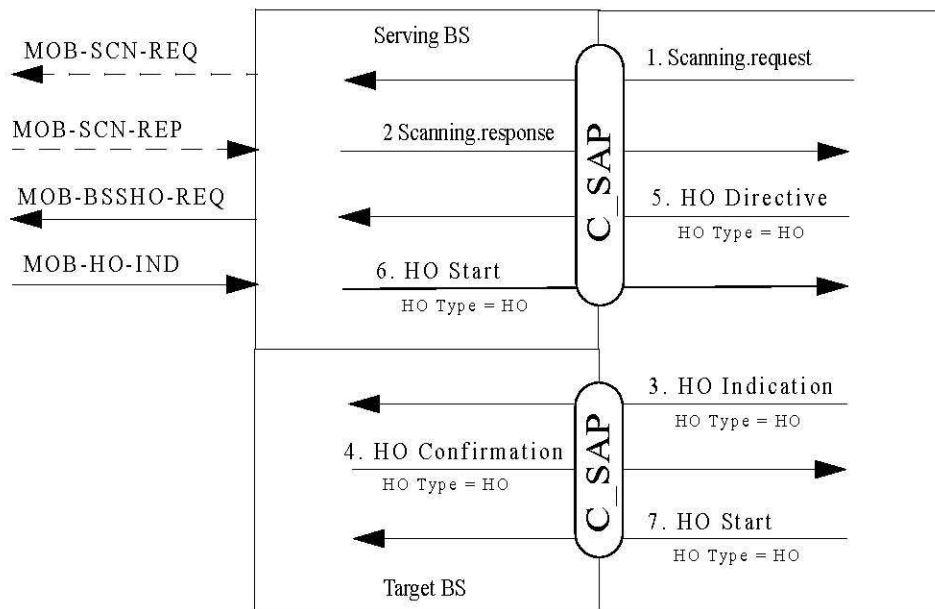


Figure 325—Example Primitive Flow of HO initiated by BS

#### 14.5.9.7.1.9.2 Semantics of the service primitive

The parameters of the primitive are as follows:

```

Scanning.confirmation
(
    Number of MS,
    List of MS ID,
    List of Signal information
)

```

```

Number of MS
    Number of MSs
List of MS ID
    The list of MS ID
List of Signal Information
    TBD.

```

#### 14.5.9.7.1.9.3 When generated

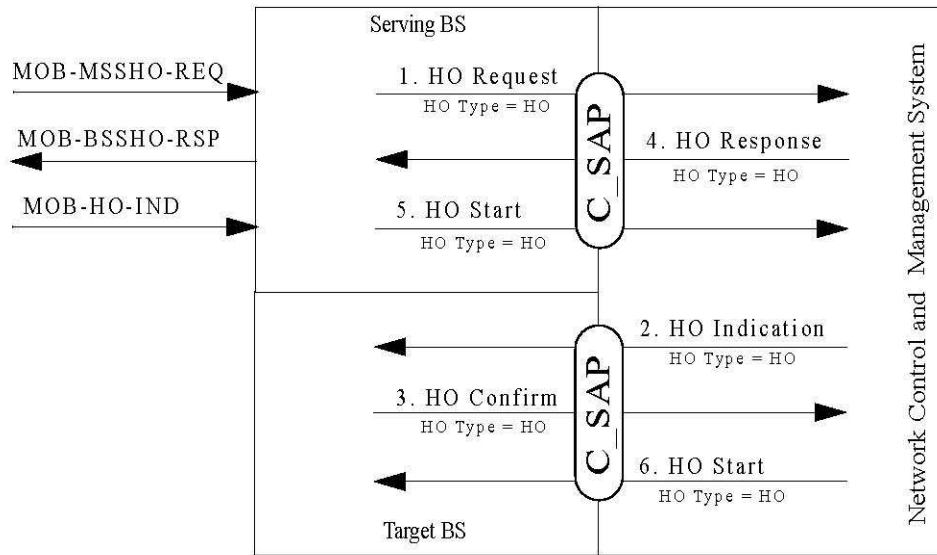
This primitive is generated when the receives scanning.request

#### 14.5.9.7.1.9.4 Effect of receipt

The mobility management entity in NCMS may decide the specific MS and its potential target BS for BS-initiated HO based on the reported signal quality in the scanning.response primitive.

<Note to Editor: Move the following sections into Annex G>

**14.5.9.7.2 Hard Handoff Procedures**



**Figure 326—Example Primitive Flow of HO Initiated by MS**

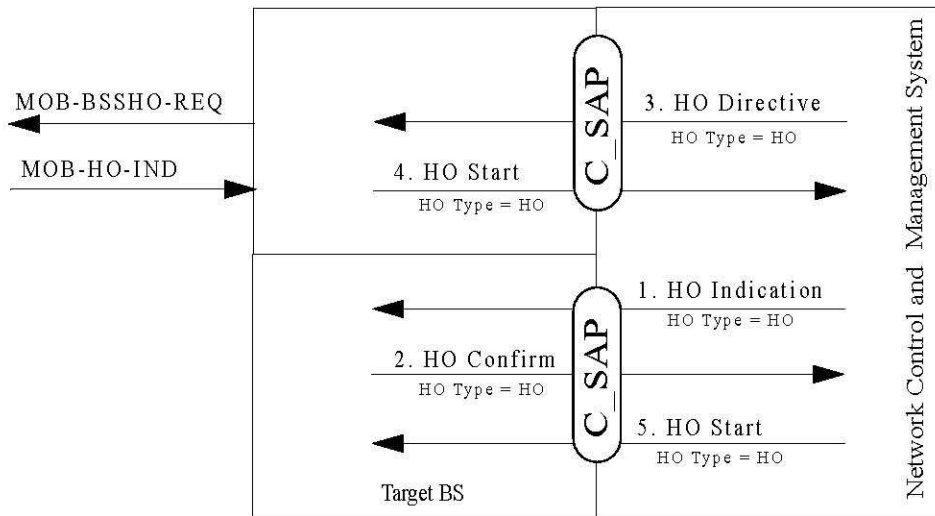


Figure 327—Example Primitive Flow of HO Initiated by BS

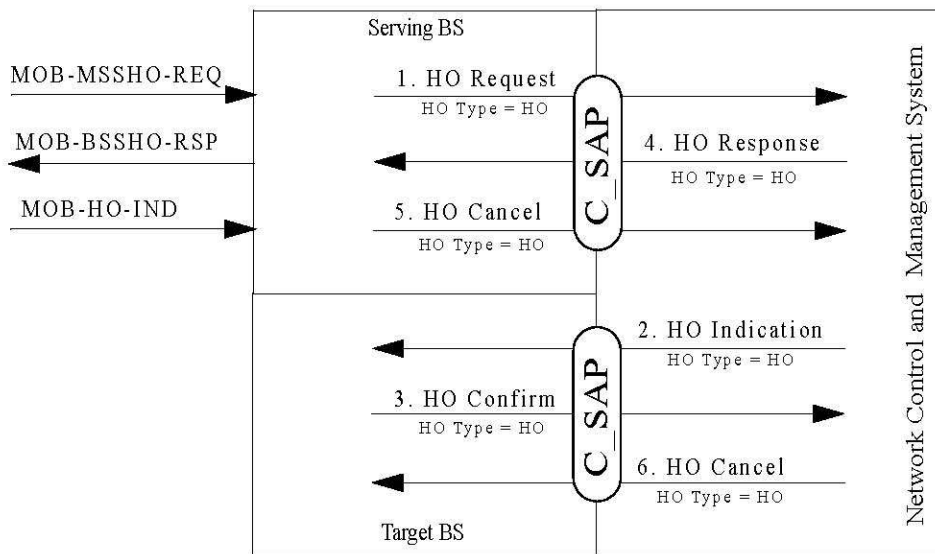


Figure 328—Example Primitive Flow of HO Cancel

14.5.9.7.3 Fast Base Station Switching Procedures

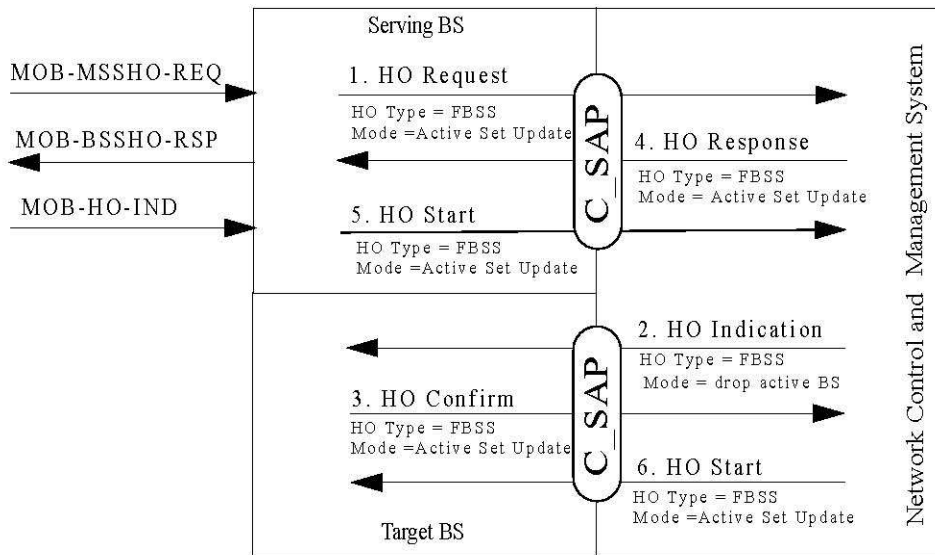


Figure 329—Example Primitive Flow of Active Set Update (Add)

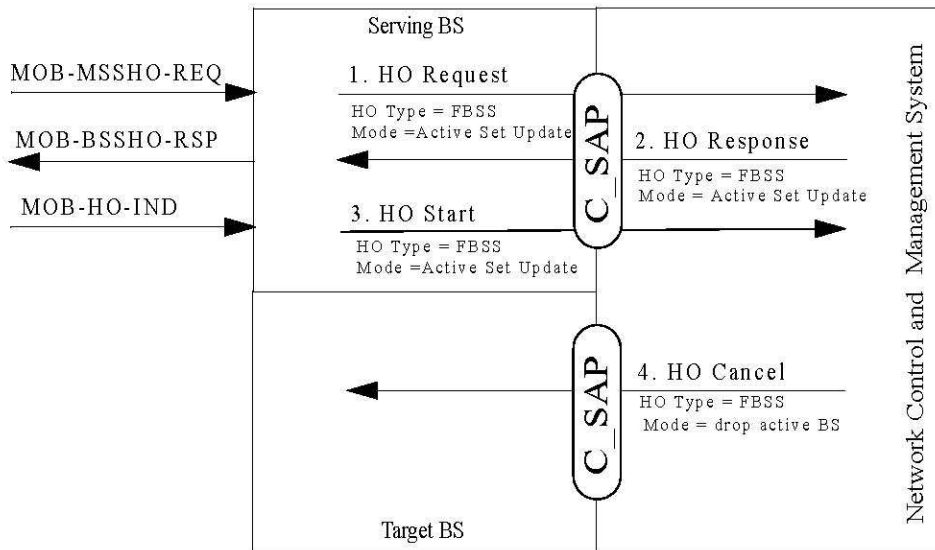


Figure 330—Example Primitive Flow of Active Set Update (Drop)

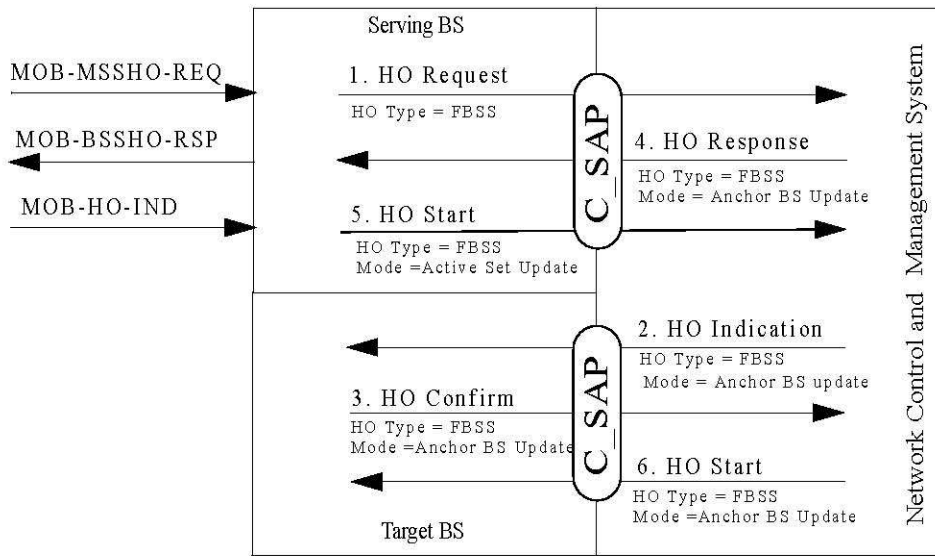


Figure 331—Example Primitive Flow of Anchor BS Update (Using MAC messages)

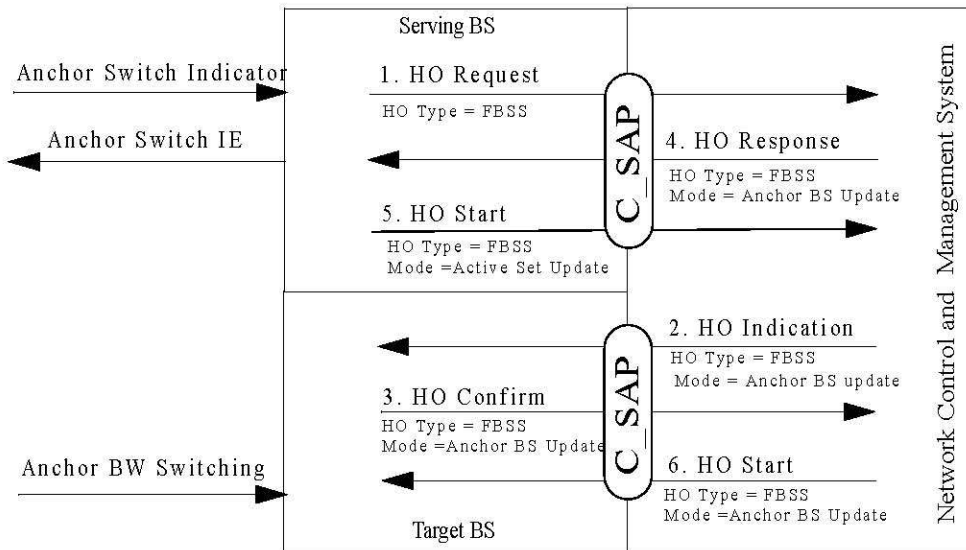


Figure 332—Example Primitive Flow of Anchor BS Update (Using selection feedback mechanism)

14.5.9.7.4 Soft Handoff Procedures

~~SHO procedures are the same as FBSS procedures except that the primitives may have different parameter values.~~